REMARKS

Reconsideration is requested in view of the amendments above and the remarks below. Claims 1-25 were cancelled and new Claims 26-50 were added. New Claims 26-50 are supported in the specification.

Rejection Under 35 USC 103

The Office Action rejected Claims 1-25 under 35 USC 103 over U.S. Pat. No. 5,317,140 (Dunthorn) and U.S. Pat. No. 4,699,468 (Harasim). The rejection should be withdrawn in view of the amendments above and the remarks below. Applicants' claimed combination is not suggested by Dunthorn or Harasim, singly or in combination.

It is well-established that in a sense, virtually all inventions are combinations of old elements (*In re Rouffet*, 47 USPQ2d 1453, 1457), and that the USPTO may often find every element of a claimed invention in the prior art (*In re Rouffet*, 47 USPQ2d 1457). If identification of each claimed element in the prior art were sufficient to negate patentability, very few patents would ever issue. (*In re Rouffet* at 1457). It is also well-established that to establish a *prima facie* case of obviousness, the USPTO must satisfy all of the following requirements. First, the prior art relied upon, coupled with the knowledge generally available in the art at the time of the invention, must contain some suggestion or incentive that would have motivated the skilled artisan to modify a reference or to combine references. *In re Fine*, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988). Second, the proposed modification must have had a reasonable expectation of success, as determined from the vantage point of one of ordinary skill in the art at the time the invention was made. *Amgen v. Chugai Pharmaceutical Co.* 18 USPQ 2d 1016, 1023 (Fed Cir, 1991), *cert. denied* 502 U.S. 856 (1991). Third, the prior art reference or combination of references must teach or suggest all of the limitations of the claims. *In re Wilson*, 165 USPQ 494, 496, (CCPA 1970). The Office Action did not establish a *prima facie* case of obviousness.

Applicants' invention is directed to a display device that has a touch sensor and comprises a novel, non-obvious, and useful combination of (a) a transparent cover plate, (b) a transparent support plate, (c) an electrochromic cell or a liquid crystal cell, (d) a radiation source, (e) at least one photodetector. Claim 26, for instance, is directed to a display device with touch sensor comprising (a) a

transparent cover plate, (b)a transparent support plate and at least one photodetector that is mounted on the support plate and that has a photosensitive solid angle range so that the support plate lies in the photosensitive solid angle range, (c) an electrochromic cell or a liquid crystal cell located between the transparent cover plate and the transparent support plate, and (d) a radiation source arranged on at least one end face of the transparent cover plate. Applicants' invention can be used in applications in which touch screens are used. As discussed on page 1, third full paragraph, touch screens are predominantly used as input devices and display pictures, e.g., explicatory texts.

Applicants submit that one of ordinary skill in the art would not have been motivated to combine Dunthorn and Harasim. As further discussed below, Harasim does <u>not</u> teach a system and a method for optically determining the direction of an object, such as a pointer, relative to an imaging system. Harasim does <u>not</u> teach a system in which triangulation is employed to determine the location of a pointer within a generally planar viewing field, such as a touch screen. Harasim does <u>not</u> teach a system that deliberately produces diffuse or blurred image. Harasim and Dunthorn are fundamentally different. Reconsideration is requested.

Regardless, one of ordinary skill in the art following the teachings of Dunthorn would not have been motivated by Harasim to modify Dunthorn and make Applicants' invention because Dunthorn and Harasim are directed to different applications. In fact, as further discussed below, <u>Dunthorn teaches away from using the technology to which Harasim is directed</u>.

Dunthorn is directed to a system and a method for optically determining the direction of an object, such as a pointer, relative to an imaging system, particularly a system in which triangulation is employed to determine the location of a pointer within a generally planar viewing field, such as a touch screen (Abstract). Rather than using focused imaging systems to produce a sharp image at the plane of a photodetector, and to thus define the visual pen for finger position, a deliberately diffuse or blurred image is employed (Abstract). The diffusion produces a characteristic "bell-shaped" or Gaussian intensity distribution (Abstract). By recognizing the characteristic intensity distribution, the position of the maximum intensity, and thus the direction of the object, can be determined to a small fraction

of the distance between sample points, with an accordingly much higher resolution than focused systems.

Harasim is directed to a liquid crystal light modulator that operates on the basis of wave length range selection and capable of single or multi-channel transmission of speech or other analog or digital information signals by means of light passing through solid, gaseous, or liquid media (Col. 1, ll. 8-13). The liquid crystal mixture for making a liquid crystal layer can be a nematic type doped with cholesteric substances (Col.1, ll. 61-63). The liquid crystal layer is so doped that in the alternating field it has a helical structure having a pitch "p", that corresponds approximately to the wavelength λ of the light to be modulated (Col. 1, ll. 64-66). This type of liquid crystal layer is located between at least two glass plates or other material transparent for the respective wave length range (Col. 1, l. 68 to Col. 2, l. 2) The glass plates or other material layers are provided with conducting, transparent electrodes and are spaced from one another by spacer members (Col. 2, ll. 2-5).

Dunthorn and Harasim, singly or in combination, simply would not have suggested Applicants' invention. Dunthorn teaches away from the use of liquid crystals and does not teach the use of an electrochromic device. For instance, Dunthorn expressly discusses the disadvantages of liquid crystals. At Column 2, lines 30+, for instance, Dunthorn discusses the disadvantages of overlay technologies and indicates, among other things, that the problems of such technologies "<u>are especially serious when dealing with liquid crystal displays, which are characteristically dimmer than desired even without the overlay</u>." (Col. 2, ll. 45-47, *emphasis added*). If Dunthorn teaches that liquid crystals displays cause serious problems, one of ordinary skill in the art following the teachings of Dunthorn simply would not been motivated to use any liquid crystal, let alone Harasim's liquid crystal light modulator. One of ordinary skill in the art following the teachings of Dunthorn simply would not been motivated to use Harasim's doped liquid crystal layer. As such, one of ordinary skill in the art following the teachings of Dunthorn would not have combined Harasim and Dunthorn as alleged, modify Dunthorn, and practice Applicants' invention. Reconsideration is requested.

The Office Action's reliance on Dunthorn and Harasim also does not support the rejection, because the inventions taught by Dunthorn and Harasim, singly or in combination, are fundamentally different from Applicants' invention. Applicants' invention is capable of being used in touch screens that display pictures such as explicatory texts. Dunthorn does not teach a device that accomplishes this objective. As discussed above, Dunthorn teaches the use of devices that produce a deliberately diffuse or blurred image. Dunthorn teaches away from the use of liquid crystals and does not teach the use of an electrochromic device. Dunhorn, singly or in combination with Harasim does not teach Applicants' novel, non-obvious, and useful combination of (a) a transparent cover plate, (b) a transparent support plate, (c) an electrochromic cell or a liquid crystal cell, (d) a radiation source, (e) at least one photodetector. Reconsideration is requested.

Further, the device according to Dunthorn is a "non overlay" device (Col. 2, ll. 6-8) which means that there is no "device sized to fit the display is placed over or attached to the display screen itself" (Col. 2, ll. 3-4). The display device according to the invention comprises a transparent cover plate. According to Dunthorn, such overlays are disadvantageous (see Col. 2). Dunthorn therefore teaches away from the present invention. Reconsideration is requested.

The Office Action relied on Column 2, lines 30-43 to support the assertion that Dunthorn teaches an electrochromic cell or a liquid crystal cell. This is not correct. Column 2, lines 30-43 does not teach an electrochromic cell or a liquid crystal cell. Rather, this section of Dunthorn discusses problems of overlay technologies and indicates that liquid crystal displays are undesirable.

To provide further understanding differences between specific embodiments encompassed by Applicants invention and Dunthorn and Harasim, Applicants offer the following comments in the following three paragraphs. Applicants' invention preferably provide a display device with a touch sensor which is easy to construct and therefore inexpensive to produce. Further, the display device should be insusceptible to faults in continuous operation. Applicants' invention comprises a radiation source arranged on at least one end face of a transparent cover plate. Light from the radiation source enters the cover plate and illuminates it. If the transparent cover plate of the device is touched, the intensity of the light from the

radiation source is reduced. The photodetector which is mounted on the bottom of a support plate detects said reduction of light intensity. The reduction of light intensity is detected in a plane vertically to the plane the light from the radiation source is modulated and reduced. The "vertical" detection according to invention is especially advantageous if the extension of the touched space is relatively small when compared to the extension of the touch screen. The signal ratio touched/untouched is constantly high as it is always the reduction of light itself which is detected and not the reduced light which would have been detected when the photodetector and the light source lie within the same plane.

Dunthorn teaches a device that is designed to determine the position of a pointer object (Fig. 1, 50) within a planar viewing field, such as a touch screen (Col. 4, 1. 7-8). It comprises a display (Fig, 1, 30) and several cameras (32,34,36). The photodetectors, which are included in the cameras do not lie in image planes in which an image of a pointer object (50) is sharply focused as they are positioned at the upper corners of the display. The photodetectors of Applicants' invention are not positioned in such manner. Further, the light radiation sources (Fig. 1, 56, 58) according to Dunthorn lie in the same plane as the photodetectors whereas the photodetector according to Applicants' invention are not positioned in such manner.

With respect to Harasim, Harasim discloses liquid crystal light modulators. Fig. 7a, 7d-f show liquid crystal light modulators comprising two transparent glass plates forming a gap which is filled with a liquid crystal layer. The light source is located either above the upper glass plate or beneath the lower glass plate, whereas the light source according to the invention is arranged on at least one of the end faces of the transparent cover plate (see scheme 1). Fig. 9 disclose liquid crystal light modulators comprising one or more photodetectors. The photodetectors are mounted on the upper or the lower glass plate, There is no light source present. The combination of the light source according to Fig. 7 and the photodetectors of Fig. 9 would result in a liquid crystal light modulator where the light source and the photodetectors are arranged according to scheme 2. Therefore, Harasim teaches away from the present invention.

In view of the amendments and remarks above, a Notice of Allowance is earnestly requested.

Respectfully submitted,

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Marked up version of claims with revisions

26. A display device with touch sensor comprising:

(a) a transparent cover plate,

(b) a transparent support plate and at least one photodetector that is mounted on the support plate and that has a photosensitive solid angle range so that the support plate lies in the photosensitive solid angle range,

(c) an electrochromic cell or a liquid crystal cell located between the transparent cover plate and the transparent support plate,

(d) a radiation source radiation source arranged on at least one end face of the transparent cover plate so that light of the radiation source can enter and illuminate the cover plate.

27. The display device according to Claim 26, wherein the cover plate and the support plate are joined together by a ring seal to form a cell, and an electrochromic medium is located in the cell volume, and the plates are provided with a transparent electrically conductive coating on their sides facing the electrochromic medium.

28. The display device according to Claim 26, wherein the liquid crystal cell comprises a transparent top plate and a transparent bottom plate that are joined together by a ring seal and between in which the liquid crystals are located, the sides of the plates, which face one another is provided with a transparent electrically conductive coating, and with an orienting layer, and the sides of the plates that are remote from one another is provided with a polarization film.

29. The display device according to Claim 26, wherein the electrochromic cell or the liquid crystal cell has a coating on the bottom plate that predominantly reflects visible light while it is predominantly transparent to the light emitted by the radiation source.

30. The display device according to Claim 26, wherein the electrochromic cell or the liquid crystal cell has a coating on the bottom plate that optionally contains a location transparent to the light from the radiation source at the center of the photosensitive solid angle range of the photodetector.

31. The display device according to Claim 26, wherein the electrochromic cell or the liquid crystal cell has a semi-transmissive and semireflecting coating on the bottom plate.

32. The display device according to one Claim 28, wherein the electrochromic medium or the liquid crystal medium is two-dimensionally illuminated from the side facing the support plate.

33. The display device according to Claim 32, wherein (i) the two-dimensional illumination is carried out through an optically transparent grid plate that is arranged between the bottom plate and the support plate, (ii) a light source is arranged on at least one of the end faces of the grid plate and the grid plate having, on the side remote from the support plate, an optically refractive grid like surface structure for positionally metered emergence of light from the interior of the plate, and (iii) a scattering layer serving as an illumination surface is arranged on or over this side.

34. The display device according to Claim 33, wherein the grid density of the surface structure of the grid plate becomes greater with increasing distance from the light source.

35. The display device according to Claim 33, wherein the grid plate is identical to the support plate or to the bottom plate of the electrochromic cell or of the liquid crystal cell.

36. The display device according to Claim 26, wherein the cover plate has a thickness of at least 0.05 mm.

37. The display device according to Claim 26, wherein the cover plate has a refractive index of at least 1.5.

38. The display device according to Claim 26, wherein an intermediate layer is located between the top plate of the electrochromic cell or of the liquid crystal cell and the cover plate.

39. The display device according to Claim 38, wherein the intermediate layer has a refractive index that is less than the refractive index of the cover plate.

40. The display device according to Claim 38, wherein the intermediate layer comprises air or LTV radiation-polymerizable mixtures of polyfunctional (meth)acrylic acid derivatives, monofunctional (meth)acrylates or suitable photoinitiators, or of solid materials produced using a sol-gel process and having a porosity of more than 50% based on silicates, aluminates and other binary or ternary systems.

41. The display device according to Claim 26, wherein the bottom plate of the electrochromic cell or of the liquid crystal cell is identical to the support plate and/or the top plate is identical to the cover plate.

42. The display device according to Claim 26, wherein the radiation source has an emission maximum at a wavelength of more than 680 nm.

43. The display device according to Claim 26, wherein the end face illuminated by the radiation source is roughened so as to be weakly scattering.

44. The display device according to one Claim 26,wherein at least one and at most three end faces of the cover plate are coated with an optically reflecting material.

45. The display device according to Claim 44, wherein the optically reflecting material is gold, silver, copper, nickel or aluminum, and mixtures thereof, and the layers are produced by evaporation coating, sputtering, CVD or adhesive bonding of metal-coated films.

46. The display device according to Claim 26, wherein a plurality of photodetectors are fitted on the support plate, a specific region of the cover plate, in which a region is uniquely assigned to the photodetector, lying in the photosensitive solid angle range of each photodetector.

47. The display device according to Claim 26, wherein a unit for processing the electrical signal is connected downstream of each photodetector.

48. A method comprising touch recognizing a display device that includes:

(a) a transparent cover plate lying on a photosensitive solid angle range,

(b) a transparent support plate and at least one photodetector that is mounted on the support plate and that has a photosensitive solid angle range so that the support plate lies in the photosensitive solid angle range,

(c) an electrochromic cell or a liquid crystal cell located between the transparent cover plate and the transparent support plate,

(d) a radiation source radiation source arranged on at least one end face of the transparent cover plate so that light of the radiation source can enter and illuminate the cover plate,

wherein radiation from the radiation source periodically varies with time at the frequency, and the electric signal from the photodetector is further processed so that predominantly only that part of the signal which likewise varies periodically with time and approximately varies at the same frequency as the radiation power from the radiation source is evaluated.

49. The method according to Claim 48, wherein the relative width of the frequency band accepted during the further processing in the signal from the photodetector around the frequency is less than 0.1.

50. The method according to Claim 48, wherein the touch sensor can be switched off fully or for a limited time and, after a predetermined time, switches itself on again or can be switched on again by a specific signal sequence.